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ENTOMOLOGICAL NEWS

VOL. LXX NOVEMBER, 1959 No. 9

New North American Tachinidae (Diptera)[1]

By H. J. REINHARD, College Station, Texas

The present paper includes descriptions of three new genera and eight new species of muscoid flies from various western and southwestern sources, all cited under the characterizations below.

Myiophasia lasia, n. sp.

A shining black pollenless species with sides of face and front much more heavily pilose than in any related form and the abdomen with discals.

Male.—Front pinched out before triangle, which bears non-divaricate proclinate ocellars; verticals not differentiated and frontals extending from antennal base to mid front; antenna orange yellow, third segment but slightly longer than second; black, micro pubescent arista thickened near base thence slender to tip; parafacial shining black, thickly haired on entire length; vibrissae near mid face level and somewhat approximated; cheek polished black, broad but largely ventral, grooves red and unusually wide; palpus yellow, slender to tip and longer than haustellum; eye densely pilose.

Thorax velvety black, feebly shining above and rather weakly bristled; preacrostichal 2; postdorsocentral 3; sternopleural 2; scutellum with 2 lateral and 1 strong decussate apical pair. Legs rather long and slender; mid tibia with one anterolateral bristle; claws and pulvilli elongated. Wing light brown becoming grayish along hind margin; hind cross vein bisinuate, nearly in

[1] Contribution No. 3174, Department of Entomology, Texas Agricultural Experiment Station.

plane of apical cross vein; first posterior cell open near extreme wing tip; calypters brown.

Abdomen ovate, shiny black and clothed with longish erect hairs over entire surface above; intermediate segments with differentiated discals; first segment with median marginals and usually a second pair differentiated immediately in front of latter, last three segments each with a marginal row but incomplete on second; forceps slender, prongs contiguous to an acute slightly bowed tip; accessory process fingerlike and a little shorter than forceps; fifth sternite lobes broadly exposed.

Length, 6–7 mm.

Holotype, Signal Mt., Wyo., August 3, 1947 (F. A. Cowan & M. R. Wheeler). *Paratypes* 3 males: Breitenbush Lake, Marion Co., Ore., June 23, 1940 (R. E. Rieder); Rainier Natl. For., Washington, Sept. 10, 1935; and Logan, Utah, Aug. 11, 1942 (G. F. Knowlton & W. E. Peay).

Myiophasia sigilla, n. sp.

Male only.—Very similar to the preceding species including distinct median marginal bristles on the first abdominal segment. Parafrontal and parafacial gray pollinose and a little less densely haired; epistoma distinctly shorter, slightly more produced in profile; third antennal segment black; palpus brown with enlarged tip paler or reddish; wing wholly hyaline tinged with yellow near base; calypters pale tawny; abdominal hairs erect on entire surface above, without any differentiated discals.

Length, 7 mm.

Holotype: Snowy Range Mts., 11,600 ft., WYOMING, August 13, 1957 (H. J. Reinhard).

DYSCOLOMYIA, n. g.

Similar to *Meledonus* (type, *latipennis* Ald.) but with normal-sized palpi, more prominent front, larger antennae, etc.

Head nearly as long as high, frontal profile well over the slightly receding facial, antennal axis near eye middle; clypeus

very deeply sunk, facialia vertical and bare; full width epistoma produced ventrad from vibrissal level and over half as long as wide; parafacial broad, sparsely beset with micro setae; frontals in a single row stopping at antennal base; ocellars divaricate and but slightly proclinate, inner verticals straight, reclinate; antenna as long as face, first segment elongate with a thin lobe-like expansion on upper lateral extremity, third segment nearly three times length of second; arista rather short, practically bare, second segment a trifle longer than wide; cheek about equal parafacial width, bare except on narrow lower margin; haustellum quite slender but obviously shorter than head height; eye bare, reaching to vibrissal level. Thoracic chaetotaxy; acrostichal 1, 2; dorsocentral 3, 3; intraalar 2; supraalar 3 (only the middle one large); presutural 1 (outer); notopleural 2; humeral 2; posthumeral 1; sternopleural 3; pteropleural not developed; scutellum with 2 large lateral, 1 small decussate apical and 1 hardly differentiated appressed discal pair; postnotal slope bare; propleuron sparsely pilose. Wing clear, veins brown, normal in shape and reaching a little beyond tip of abdomen; third vein with three setulae near base; first posterior cell open a little before extreme wing tip; last section of fifth vein shorter than hind cross vein; cubitulus obtusely angled, without stump or fold; costal spine vestigial; calypters broader than long. Abdomen somewhat narrowed and elongated; one pair of median marginals on proximal segments and a marginal row on last two segments besides a row of strong discals behind middle of fourth; apical sternites shiny and narrowly exposed.

Genotype: *Dyscolomyia lucina,* n. sp.

Dyscolomyia lucina, n. sp.

Male only.—Head with silvery pollen becoming cinereous on occiput; frontalia subequal to width of parafrontal; latter with only sparse short setae outside frontal row; front at vertex 0.375 of head width and scarcely wider at anterior extremity; second antennal segment rufous, third entirely black and widening gradually to a broadly rounded apex; arista black, rather

strongly thickened basally tapering strongly to middle thence more slowly so to a sharp tip; palpus fully half as long as haustellum, brown basally becoming paler or reddish near apex; labellum small; occiput glabrous on upper third, remaining surface clothed with short intermixed pale and black hairs.

Thorax and scutellum black, moderately dusted with bluish gray pollen leaving four well defined black dorsal vittae; legs black, subshiny; mid tibia bearing one strong and one weaker bristle on outer front side before middle; fore claws and pulvilli exceeding length of last tarsal segment. Wing gray hyaline; calypters subopaque, white.

Abdomen shining black with last three segments lightly dusted with pale bluish gray pollen on basal half or more; genital segments black largely retracted, fifth sternite with a rather wide U-shaped excision, lobes widely exposed and clothed with black hairs.

Length, 7 mm.

Holotype male, Surprise Canyon, Inyo County, CALIFORNIA, May 9, 1958 (R. M. Bohart).

AGATHOMYIA, n. g.

Differs from *Plagiomima* in having a much shorter and stouter proboscis, larger labella, more retracted hind cross vein, etc.

Head nearly one-third wider than high, frontal profile subequal to slightly receding facial; clypeus moderately depressed, epistoma gently bowed forward from clypeal plane and produced ventrad from vibrissal angle; oral margin axis fully three-fourths length of antennal, which is shortly above eye middle; vibrissae on oral margin well above lower edge of head; bare facialia depressed beneath level of parafacialia; latter setose from lower frontal to cheek groove; palpus equal length of haustellum; ocellars divaricate; cheek bare, one-fifth eye length; eye bare, descending to or a trifle below vibrissal level. Thoracic chaetotaxy: acrostichal 3, 3; dorsocentral 3, 3; postalar 2 (hindmost strong); supraalar 3; intraalar 3; posthumeral 1; humeral 3; notopleural 2; presutural 2; sternopleural 3; pteropleural vestigial; scutellum with 2 lateral (hindmost very large); 1

decussate apical and 1 weak preapical pair. Wing barely reaching beyond tip of abdomen; first and third veins setulose; hind cross vein joining fourth about its length from small cross vein; first posterior cell open far before wing tip; costal spine minute. Abdomen slightly wider than thorax; one pair of median marginals on second segment and a marginal row on following two plus a discal row well behind middle on last; sternites covered.

Genotype: *Agathomyia cordata,* n. sp.

Agathomyia cordata, n. sp.

Female.—Head densely gray pollinose, occiput gently convex, clothed with rather short sparse pale hairs; front at vertex 0.44 of head width and nearly equibroad downward; frontalia wider than parafrontal; latter with a few scattered short setae and two stout proclinate orbitals; verticals two, outer one nearly as large as inner; lowermost frontal about on level with middle of third antennal segment; short black bare arista thickened well beyond middle, second segment barely longer than thick; basal antennal segments reddish yellow, third black about one-half longer than second; palpus yellow, slender with tip slightly enlarged; labella soft in texture and wider than haustellum.

Thorax and scutellum black dusted with gray pollen and marked with four narrow black vittae above which become obsolete before scutellum base. Legs subshiny black, mid tibia with a row of unequal bristles on outer front side; claws and pulvilli short. Wing whitish hyaline; cubitulus bearing a stump and fold which approximate length of apical cross vein; last section of fifth vein almost twice length of preceding; calypters opaque white.

Abdomen black dusted with gray pollen except on apical third or less of segments two to four which appear darker and shining in most views, hairs on entire upper surface fine and closely appressed; venter shiny; anal orifice, caudo ventral, rounded on upper margin. Male unknown.

Length, 6.5–7.5 mm.

Holotype: Anza Riv. Co., CAL., VII–5–56 (R. M. Bohart).

Paratype: 1 female, Rodeo, N. Mex., Hidalgo Co., VIII–28–58 (R. M. Bohart).

Thelymyia disparis, n. sp.

The present assignment for the species is provisional since it differs from *Thelymyia* in having four postsutural dorsocentrals and lacks abdominal discals. However, the wide male front bearing strong proclinate orbitals, short claws and pulvilli, pilose eyes, etc., seems to indicate an apparent relationship here. The question of restricted generic reference is left open pending accumulation of more material. Perhaps the most nearly related described species is *Zenillia mathesoni* Reinhard (Bul. Brk. Ent. Soc., 32, 1937, 68), which was omitted from Seller's treatment (Proc. U. S. N. M., 93, 1943) of the present and allied genera.

Male.—Head pollen gray faintly tinged with yellow on sides of face and front; vertex 0.33 of head width, front gradually widening forward to antennal base; verticals two pairs; ocellars strong, proclinate; facialia weakly bristled on lower fourth or less; antenna black, third segment about two and one-half times second; arista but slightly thickened to middle, bare; palpus yellow, infuscated basally; cheek black haired, one-sixth eye length; eye distinctly pilose; occiput wholly pale-pilose.

Thorax black, gray pollinose, marked by four notal vittae; chaetotaxy as in *Thelymyia* except as noted above; scutellum largely reddish, with decussate apical bristles directed rearward. Legs black, mid tibia with three anterolateral bristles, hind tibia unevenly ciliated. Wing gray hyaline, third vein with two setulae near base; first posterior cell open shortly before exact wing tip; calypters semitranslucent white.

Abdomen black with dense gray pollen except along median line of last three segments; one pair of median marginals on two basal segments and a marginal row on last two, with irregularly spaced discals on anal segment; hypopygium black, small, retracted. Female unknown.

Length, 9–11 mm.

Holotype: West slope Patagonia Mts., Sta. Cruz Co., Ari-

ZONA, August 9, 1955 (G. D. Butler & F. G. Werner). *Paratypes:* 2 males, same data as type.

ANGUSTIOPSIS, n. g.

Allied to *Angustia* and *Aplomya* as limited by Sellers (Proc. U. S. N. M. 93, 1943) but, as enumerated below, with seemingly important differences in the diagnostic characters which have been ascribed to each.

Front strongly narrowed above middle in male, gradually convergent to vertex in female; second antennal segment subequal to one-half length of third; arista bare, longer than usual, not much thickened on basal half, thence delicate to tip; frontal bristles descending to base of third antennal segment; cheek about one-fifth eye length. Thoracic chaetotaxy: acrostichal 3, 3; dorsocentral 3, 4; intraalar 3; supraalar 3; humeral 4–5; posthumeral 2; notopleural 2; presutural 2; postalar 3; intrapostalar 1 (strong); pteropleural 2 (smaller than hindmost sternopleural); sternopleural 2; scutellum with 3 strong lateral, 1 apical and 1 good-sized appressed discal pair. Hind tibia closely (evenly in male) ciliate; mid tibia with three or four anterolateral bristles. Abdomen broadly ovate, second segment with a pair of median marginals in female, third bearing a marginal row of spinelike macrochaetae and fourth segment with erect smaller bristles and hairs over entire upper surface; no discals on intermediate segments.

Genotype: *Angustiopsis saginata,* n. sp.

Angustiopsis saginata, n. sp.

Male.—Front at vertex 0.22 of head width equibroad on upper third thence widening rapidly downward into facial angle; parafrontal with dense gray pollen becoming darker before vertex, clothed with bristly to fine black hairs outside of main frontal row; frontalia deep reddish brown, wider than parafrontal except at anterior extremity; ocellars proclinate; inner verticals erect, not very long; parafacial subsilvery, bare from lower frontal to cheek groove; vibrissae barely differentiated from bristles next above; antenna wholly black reaching almost

to oral margin; facialia with weak bristles and hairs on lower fourth; proboscis short, labella large and fleshy; palpus longer than haustellum, red with basal half brownish; eye thickly pale pilose, reaching to vibrissal level; occiput clothed with ruff of dense pale hairs.

Thorax gray pollinose on black ground color, notum marked with five changeable black vittae; scutellum entirely reddish and lightly dusted with gray pollen; prosternum setose on sides. Wing gray hyaline, veins yellow, third with two to four hairs near base; first posterior cell open shortly before wing tip; hind cross vein two-thirds its length from cubitulus, latter stumpless and only about one-fourth wing width from hind margin; costal spine vestigial; calypters opaque white. Legs black, long but not very slender; mid tibia with three anterolateral bristles, hind tibia closely, evenly ciliated on posterolateral face; pulvilli and reddish black-tipped claws subequal to combined length of last two tarsal segments.

Abdomen black with sides somewhat reddish, last three segments thinly gray pollinose to or nearly to hind margin of each, a narrow dark median vitta visible in most views; hairs on upper surface of three basal segments fine and closely set; hypopygium small, retracted.

Female.—Front at vertex 0.31 of head width gradually diverging to antennal base; abdomen predominantly black with a coarser sparser vestiture of hairs above; one pair of strong erect median marginal bristles; hind tibia ciliate with one longer bristle in row; otherwise as in male except for sexual differences.

Length, 10–12 mm.

Holotype: male and allotype female, Presidio Co., TEXAS, July 13, 1940. *Paratypes:* 2 females, Brownsville, Texas, May 4, 1957 (H. J. Reinhard).

Lydella immissa, n. sp.

Allied to *L. minor* but larger in build, facialia bristled on lower half or less, intermediate abdominal segments with numerous discals, etc.

Male.—Head gray pollinose on dark background, except reddish cheek groove; front at vertex 0.22 of head width, diverging rapidly below middle into facial angle; frontalia striate, wider than parafrontal, deep reddish brown to black; frontal row reaching about to base of third antennal segment, upper two bristles reclinate about as large as erect inner verticals; ocellars large, proclinate; antenna entirely black, second segment over half as long as third and thickly beset with bristly hairs on front margin; long, bare, black arista thickened on basal third or less; parafacial bare on lower half; long decussate vibrissae, slightly above oral margin; proboscis short, labella large, yellow black-haired palpus considerably longer than haustellum; eye bare; cheek three-elevenths eye length; occiput gently convex clothed with pale pilose hairs.

Thorax and scutellum black dusted with gray pollen, notum marked with four rather broad and changeable black vittae before suture and five behind all becoming obsolete before base of scutellum. Chaetotaxy: acrostichal 3, 3; dorsocentral 3, 3; intraalar 3; supraalar 3; postalar 3; humeral 4; posthumeral 1; presutural 2 (outer large); notopleural 2; sternopleural 2, 1; pteropleural 1 (smaller than hindmost sternopleural); scutellum with 3 lateral, 1 longish erect divergent apical and 1 reclinate discal pair barely differentiated among numerous long erect slender bristles; prosternum and postnotal slope setose, propleuron bare. Legs black, long but not very slender; mid tibia with one large and one small anterolateral bristles; claws and pulvilli elongate. Wing gray hyaline with a slight yellowish tinge on costal half; veins brown, bare except four or five setulae near base of third; first posterior cell open considerably before wing tip; bisinuate hind cross vein its length from broadly rounded cubitulus, latter without stump or fold; costal spine vestigial; calypters opaque white tinged with yellow on outer margin.

Abdomen narrower and longer than thorax, black in ground color tinged with red at sides, last third segments with gray pollen extending thinly to hind margin of each; median marginal pair on first segment and a marginal row on last three, besides

numerous erect and irregularly spaced discals on each of latter; genital forceps rather short, hind surface very densely clothed with downy yellowish hairs to about apical fourth thence glabrous to blunt apex; accessory process as long as forceps but distinctly wider in profile view; fifth sternite lobes largely retracted. Female unknown.

Length, 9.5–10 mm.

Holotype: Zamora, Mich., MEXICO, August 27, 1947 (F. A. Cowan & M. R. Wheeler). *Paratype:* 1 male, same data as type.

Dexodes sartura, n. sp.

Traces here in most available keys differing from the preceding species chiefly as follows:

Male.—Head silvery pollinose, front wider, measuring 0.27 of head width at vertex; third antennal segment fully four times length of second; cheek one-fifth eye length; vibrissae on oral margin; arista thickened on basal fifth or less; thorax and abdomen overlaid with heavy opaque gray pollen with a slight brownish tinge apparent in some angles of view; apical scutellars and inner presutural bristle lacking and only one good-sized preacrostichal; postnotal slope usually bare; legs rather slender, tibiae paler or reddish in ground color; wing clear, with yellow veins; first posterior cell open shortly before extreme wing tip; abdomen bearing fewer discals on intermediate segments; genital forceps slender and recurved on apical half; accessory process fingerlike as long as forceps, gently bowed forward from base to tip.

Female.—Similar to male except for the usual sexual differences.

Length, 7.5–9 mm.

Holotype male and allotype female, Babylon, L. I., NEW YORK, May 26, 1935 (Blanton & Borders). *Paratypes:* 1 male and 1 female, same data as type; 1 male, West Hills, L. I., N. Y., June 1, 1935 (Blanton & Borders) and 1 female, Amherst, Ohio, July, 1933 (H. J. Reinhard).

Factors Affecting Larval Migration of the Gypsy Moth

By Robert C. Wallis, The Connecticut Agricultural Experiment Station, New Haven

The gypsy moth, *Porthetria dispar* (L.) is a serious economic pest of New England woodlands because of the defoliation caused by the larvae. The severity of defoliation is in part associated with the migration of the larvae. Consequently, study of factors which influence larval migration is important, and more information is necessary to understand the ecology of the insect.

In 1896 Forbush and Fernald described the positive phototrophism of young gypsy moth larvae, and associated it with practical problems of distribution. Much later, in 1930, in a study of larval behavior, de Lepiney described a stimulation of migratory activity by light and a strong negative geotrophism of the larvae. However, it was not until 1947 that a practical relationship between migratory activity and differences in the amount of defoliation in forest sites was suggested by Bess, Spurr and Littlefield. They reported that in certain forest conditions the larvae migrated down from the woodland canopy into the litter and forest understory where the larvae were more susceptible to predation by small mammals. Under other conditions the larvae did not migrate, but remained in the canopy. Bess and coworkers (1947) suggested that the larvae migrated down into the litter and understory seeking cool moist places in which to rest and pupate. Because of these very interesting observations, when the present study of gypsy moth ecology was initiated in 1953, special attention was given to factors involved in larval migration, and its relationship to defoliation.

Laboratory studies

One of the first goals of this study was to determine experimentally whether larvae exhibited a preference for moist sites, or any tendency to migrate toward such sites in which to rest between feeding periods. This was accomplished by utilizing

techniques which permitted observation of larval migration in relation to this factor and others—such as food sources providing olfactory stimuli, the influence of geotrophism, and the effect of light. Tubular plastic cylinders, four inches in diameter, one, two and three feet long, were constructed with an access hatch in the center and both open ends covered with 56 gauge nylon netting. Groups of both laboratory reared and field collected larvae in each larval instar were tested for moisture attraction by placing from 10 to 100 larvae in each cylinder with a moisture gradient. When the laboratory relative humidity was lowered to 30 ± 10 per cent and a wet pad was placed at the bottom end of the cylinder (with the lower end capped and the upper end left open) there was a moist site at one end and a dry one at the other. Larvae were placed in the cylinder through the middle hatch and the direction of their migration observed. Test cylinders of various lengths provided different distances from the wet and dry sites.

For single factor tests of moisture the cylinders were placed in a horizontal position in the presence of balanced light intensity at either end. One hour later the numbers of larvae distributed on the wet and dry side of the middle were counted. Groups composed of each five larval instars were tested and each test replicated three times to rule out chance observations.

This procedure was then repeated with fresh young red oak leaves as a test attractant in place of the moist site. This was followed by substituting a strong light (reflected sunlight intensity, projected through a 1 cm. aperture) at one end of the cyinder.

Tests for interaction of factors and for the effect of geotrophism were conducted by rotating the test cylinders from a horizontal to a vertical position. Thus, first instar larvae exhibiting a negative geotrophism migrated to the dry end when it was in the up position.

In these tests it was found that larvae migrated toward a moist site only when responding to another interacting factor (such as light) or when exhibiting a negative geotrophic response. When test cylinders were in the horizontal position,

larvae were randomly distributed between the wet and the dry ends. First and second instar larvae migrated to the moist end of the tube only when it was in the up position of the vertical tests. When the cylinders were inverted, the larvae then migrated to the dry ends which were in the up position. Middle and late instar larvae lost the geotrophic orientation and were distributed randomly within the cylinders regardless of the position of the moist sites. Similar responses were observed when light was substituted as a factor in tests with moist sites, except that young larvae migrated toward light even when it was at the bottom of the cylinders and older instar larvae moved away from the lighted end regardless of whether it was in the up or down position. The positive phototrophism of the young larvae and the avoidance of light by the older larvae were exhibited regardless of the position of moisture in the tube.

The responses to the presence of oak leaves in the tests were similar to those observed with moisture. The food alone elicited no migratory responses, but once food was encountered during random ambulatory movements or in the course of migration stimulated by other factors (light, negative geotrophism) larvae accumulated on the leaves and fed.

Field Study

Study of larval responses was conducted in field experiments at Bethany, Connecticut, in the spring of 1956. A number of trees were selected in various sites within an area of woodland where a high population of gypsy moth larvae existed. The trunks of six red oak trees, and low vertical branches were treated with pairs of four inch rings of *Tree Tanglefoot* covered with loose burlap bands. Thus, larvae travelling up the tree trunks were trapped under the lower bands and those moving down the trunks were trapped under the upper bands. The study area was observed daily during the larval growing season and at bi-weekly intervals larvae trapped under the bands.

Results of field studies were similar to those observed in the laboratory. During the first three-week period almost all of the

young larvae trapped under the burlap bands were under lower band, indicating movement upward on the tree trunk. Only occasional young larvae were encountered under the upper bands. However, during the second three-week period when larvae were in later instars, increasing numbers were found trapped under the upper band. By the time the trees had been defoliated and first pupae began to appear, almost equal numbers of late instar larvae were found under the upper and lower bands.

Discussion

The study of factors affecting migration of the gypsy moth larvae is perhaps one of the most fascinating problems confronting insect ecologists in New England. In this problem results of laboratory tests show how larvae react and when this information is applied to migration in the field, it helps explain the movements of the larvae between the forest canopy and understory. While one of the obvious factors which might attract the larvae to the understory is the presence of cool moist places it provides for resting and pupation, the results of this study show that migrations of the larvae are considerably more complicated and a response to any one factor such as moisture. In the laboratory, larvae did not migrate toward moist sites unless some other factor was interacting with the moisture. This was difficult to see in field studies, but in the laboratory manipulation of single factors, both alone and against each other, the importance of interacting factors was demonstrated. In tests conducted in darkness, young larvae exhibited a negative geotrophism and migrated upward. Both food and moisture were encountered when they were located at the top of test cylinders. However, when food and moisture were at the bottom, the larvae migrated away from them unless light was added to the bottom. Then the larvae migrated toward the light, overcoming their negative geotrophism. Thus, it was shown that the upward surge of young larvae was a summation of the reactions to these two factors—and that light was the stronger of the two. Complications arose, however, as the definitive responses which

the young larvae exhibited were lost by older larvae. The late instar larvae no longer migrated upward in the dark and lost their positive phototrophism. Essentially there was a reversal of the earlier reactions which resulted in downward movement of larvae. At the present time it is not clear if this was a result of a loss of negative geotrophism and the development of an avoidance of light, or whether the larvae developed an avoidance reaction to the heat which was associated with the light. In 1930 de Lepiney described the stimulation of resting larvae by direct sunlight. This movement resembled an avoidance reaction similar to the activity exhibited in the present experiments by late instar larvae in test cylinders, and to the activity observed in field experiments where the avoidance of light was associated with larvae migrating down out of the trees. There is a possibility that an additional factor is involved—a "hunger drive" brought about by heat from the sun increasing the metabolic activity of the larvae. Further study is necessary of the influence of heat and light on the movement of late instar larvae to determine which factor or factors elicits their avoidance reaction and downward migration. The observation of Bess *et al.* (1947) that larvae did not migrate down from the forest canopy where there was no moist understory is not explained in this study. However, it is suggested that the change in response of older larvae may be involved. Therefore, the entire story of migration by gypsy moth larvae is not settled and further study is necessary.

Summary

Laboratory tests were conducted in which the manipulation of plastic cylinders was utilized to determine the effect of food, moisture, light and geotrophism on migratory activity of gypsy moth larvae. Food was encountered primarily in the process of migration stimulated by these factors and the larvae exhibited no indication of being attracted by it alone. Likewise, no attraction or tendency of the larvae to migrate toward moisture could be observed in laboratory experiments except, as in the case with food, when the larvae were responding to the influence

of other factors. Early instar larvae exhibited the strong phototrophic response described by Forbush and Fernald and the negative geotrophic reaction reported by deLepiney. However, in both field and laboratory tests the migratory movements of late instar larvae appeared quite different from those of young larvae. For this reason, it is necessary to consider larval age and the influence of interacting factors when larval migratory activity is under study.

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An Unusual Occurrence of Rhinoceros Beetles, (Scarabaeidae Dynastes tityus Linn.)

By DAVID L. WRAY, North Carolina Department of Agriculture, Raleigh, N. C.

The following record of occurrence in considerable numbers of the Rhinoceros beetle (*Dynastes tityus* Linn.) seems worthy of note. Recently a male and female rhinoceros beetle were received at the State Museum from Mr. Wade Lewis, a student of entomology, who collected them at Thurmond, Surry County, North Carolina on March 10, 1959, "in an old rotten stump of an oak tree." The unusual thing about this is that 62 adults were found in the one stump, the sexual ratio being 31 males and 31 females. Literature on this beetle reveals little in regard to population numbers and sex ratios. I have never found over one or two specimens of this beetle at any one time in all the years of my collecting. Thurmond, North Carolina, is situated on the eastern slope of the base of the Blue Ridge Mountains and hardwoods abound in this area favoring a good habitat for Dynastes.

Collembola from Japan. II. Isotominae [1]

By Harold George Scott [2]

This paper records four species of springtail insects collected by Captain John E. Scanlon [3] while with the 406th Medical General Laboratory (U. S. Army) in Japan. None has been recorded previously from Japan. Specimens will be deposited with the Academy of Natural Sciences, Philadelphia, Pennsylvania.

Isotoma maritima forma **maritima** Tullberg, 1871

The Japanese specimens agree with the original description and with the redescriptions by Schott (1893) and Agren (1903).

Japanese Records. From rodent nests (7–iii–1952, Tokyo; and 19–iii–1952, Akabane), Honshu, by J. E. Scanlon.

Distribution. Form *maritima:* Japan, northern Europe (seashores), southern Europe (caves), Costa Rica (caves). Form *pseudomaritima* Stach, 1947: central and southern Europe (moss, under bark, under stones).

Isotoma viridis Bourlet, 1839

This species, extremely variable in body color, has been divided into ten color forms (summarized by Stach, 1947). Based upon my experience, both in this and other studies, such a division is not valid. For example, each of the two Japanese collections contain f. *viridis;* f. *arctica* Schott, 1893; and f. *pallida* Nicolet, 1841. Dr. Harry D. Pratt (same address as author) suggests that f. *pallida* represents individuals which have recently molted. This is supported by the fact that specimens of f. *pallida* are almost entirely white, and when mounted by techniques which leave other forms undamaged their exo-

[1] Part I appeared in Ent. News, 70(6): 161–163.

[2] Training Branch, Communicable Disease Center, Bureau of State Services, Public Health Service, U. S. Department of Health, Education, and Welfare, Atlanta, Georgia.

[3] Medical Service Corps, U. S. Army. Present address: Department of Entomology, University of Maryland, College Park, Maryland.

skeletons shrink and warp. The similarity in appearance between this species and *Isotoma gracilliseta* described from Japan by Yosii (1939) is recognized, but the Scanlon specimens are clearly *I. viridis*.

JAPANESE RECORDS. Soil from rodent burrows (2 separate collections), 23–x–1952, Shizuoka, Subashiri, Honshu, by J. E. Scanlon.

DISTRIBUTION. Eurasia (Japan to France, Spitzbergen to Malta), Iceland, Greenland, North America (Alaska to Mexico, Nova Scotia to California). Usually under objects on ground; in humus, grass, or moss; or atop snow.

Folsomia octoculata Handschin, 1925

Only one individual of this species is present in the Scanlon collections, but it agrees with the original description.

JAPANESE RECORD. Berlese funnel sample of soil from bamboo grove in woods, 677 meters altitude, 20–vi–1952, Beppu, Oita Ken, Kyushu, by J. E. Scanlon.

DISTRIBUTION. Japan, India, Indonesia.

Folsomia decemoculata Stach, 1946

Only one individual of this species is present in the Scanlon collections, but it agrees with the original description.

JAPANESE RECORD. Soil from rodent burrow, 23–x–1952, Shizuoka, Subashiri, Honshu, by J. E. Scanlon.

DISTRIBUTION: Japan, Europe.

Key references to Japanese Isotominae are: Borner, 1909; Folsom, 1899; Stach, 1947; Yosii, 1939, 1953.

SUMMARY

Isotoma maritima f. *martima*, *I. viridis*, *Folsomia octoculata*, and *F. decemoculata* are recorded for the first time from Japan. The invalidity of defining color forms of *I. viridis* is discussed.

Japanese Summary

(By Dr. Nobuo Sakurai, Department of Bacteriology, School of Medicine, University of Chiba, Chiba, Japan.)

3種のCollembolaが日本本州における鱗歯類の巣から記録された。すなわち、Isotoma maritima f. maritima (東京, 赤羽) Isotoma viridis (静岡, 須走) および Folsomia decemoculata (静岡, 須走)である。このほか、Folsomia octoculata が九州、大分県別府の竹やぶの土から記録された。これらのいずれもがかって日本から報告されていない。Isotoma viridis のいろわけによるいみづけが役にたないことを言命じた。

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Obituary

Professor Doctor HERMANN HAUPT of the Martin Luther University in Halle-an-der-Saale died on June 2nd, in the 86th year of his life. He was the author of important papers on Pompilidae, on which family he was a leading world authority, and certainly the most eminent in Europe. He was also a noted authority on Homoptera.

A New Journal

"Pacific Insects," the first issue of which has just appeared, is planned to consist of four issues per volume of at least 400 pages. It is being published by the Entomology Department, Bernice P. Bishop Museum, Honolulu, Hawaii, U. S. A., and is to be the organ of the program "Zoogeography and evolution of Pacific insects," sponsored by that Department. It is intended primarily for monographs or for zoogeographical papers on insects and other terrestrial arthropods from the Pacific area, including eastern Asia, Australia, and Antarctica. It is edited by Dr. J. L. Gressitt (Editor) and an editorial committee including the names of Hardy, Lieftinck, Maa, Mackerras, Quate, Szent-Ivany, Usinger, and Yasumatsu. The editors should be consulted before submitting manuscripts, of which there should be two copies, original and carbon.

Subscription, per volume, in North America $5.00, payable to the Bishop Museum (mail to Dr. Carl M. Yoshimoto), or Yen 1,700 or £1/15/6 Stg., payable to Dr. Keizo Yasumatsu, Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan.

Critical Remarks on a Recent Contribution to the Taxonomy of the Acridoidea (Orthoptera) by V. M. Dirsh

By James A. G. Rehn and Harold J. Grant, Jr.,
Department of Insects, Academy of Natural
Sciences of Philadelphia

In 1956 there appeared an important paper by V. M. Dirsh on the phallic complex of the Acridoidea in relation to the taxonomy of this group.[1] The work reviews the structure and terminology of the phallic complex, describes it for each family and subfamily in the Acridoidea, figures the epiphallus of a great many genera and species and the whole phallic complex of a selected few, and erects several new families or subfamilies. After having worked with this paper since its receipt we have become aware of certain errors and misconceptions which should, we feel, be brought to the attention of others interested in the subject. The major character of this contribution should not be minimized, and it is not our intent to do so here. However, it is important that students who lack the necessary materials (i.e., comprehensive collections and libraries) to verify some of the conclusions reached, or facts presented, be made aware of some of the errors which have crept into the work. It is in the spirit of constructive criticism that we offer the following remarks.

Concerning the definition of the subfamilies Acridinae (in the usual sense) and Oedipodinae there have always been areas of doubt and uncertainty. Dirsh has removed the tribe Truxalini from the Acridinae and elevates it to the rank of a subfamily. Further, he places the subfamily Oedipodinae with the remaining genera of the Acridinae (that is, the tribe Acridini) in one subfamily which he calls the Acridinae. These assignments are not based on genitalic characters. Indeed, both Dirsh and, much earlier, Roberts [2] point out that the Acridinae-Oedipodinae cannot be separated on the basis of differences in the phallic com-

[1] Trans. Roy. Entom. Soc. London, 108, pp. 223–356 (1956).
[2] Proc. Acad. Nat. Sci. Phila., XCIII, p. 225 (1941).

plex. Instead, Dirsh maintains that the Acridinae (in his sense) may be separated from the Truxalinae (in his usage) by characters of the external morphology. Thus the Acridinae (of Dirsh) are characterized as lacking "stridulatory pegs" on the internal side of the hind femur and "in most cases" possess a "more or less well developed intercalary vein in the medial area of the elytron." The Truxalinae are said to possess the stridulatory pegs and lack the intercalary vein. It would thus appear to the neophyte that the decades-old problem of Acridinae vs. Oedipodinae has been at last settled. But let us look further into the facts of the case.

On the basis of the total of morphological characteristics it is not logical to lump the Oedipodinae with many of the genera of the Acridinae. To do so results in having forms of such diverse structure and obviously different phylogeny as *Dissosteira* and *Acrida* in the same subfamily. Nor are there characters to support such an obviously artificial system. In order for a morphological character (other than one primarily of the sexual organs) to be the sole criterion for the separation of subfamilies it should be present and evident in both sexes, and, unless it is an alar structure, should not be qualified by the degree of development of the wings. Unfortunately, the character advanced by Dirsh as the means to separate these subfamilies does not answer these requirements. For example, in the Truxalinae (*sensu* Dirsh) the single character advanced by Dirsh as a means of separating them from the Acridinae—the presence of stridulatory pegs—is absent in the females of many genera (among others *Drepanopterna, Ageneotettix, Ligurotettix*). According to his system, then, only the males can be placed in the Truxalinae. Again, in the Acridinae *the* diagnostic character is said to be "the absence of stridulatory pegs" and included in this subfamily is the genus *Radinotatum*. In fact, *R. carinatum carinatum* possesses stridulatory pegs in the male, but lacks them in the female. Interestingly, the unreliability of this character is demonstrated further by its variability in the same genus and species. The subspecies *R. c. peninsulare* lacks the stridulatory pegs in both sexes. The point at issue,

as we see it, is whether great taxonomic weight can be given to a character which is sex correlated in many cases, variable even at the subspecific level, and primarily of a functional rather than phylogenetic nature. This last point is well demonstrated by *R. c. peninsulare* (among several others). In this subspecies the tegmina are very short and the effectiveness of femoral teeth for stridulation, if present, would probably be nil. Again, in the genus *Mecostethus* (olim *Stethophyma*) the functional nature of this character is well illustrated. In this genus the nodes or asperities are developed on the intercalary and adjacent cross-veins, while the internal carina of the caudal femur is smooth, but strongly developed as a sublamellate ridge.

In his key to the families based on external characters (p. 267) Dirsh makes two errors of fact in the first two alternatives given. The Proscopiidae (most of the known genera of which are before us) certainly cannot be characterized as having "hind legs almost cursorial." In 1952, Rehn [3] pointed out their saltatorial nature from personal observations of living material made in the field. Further, any casual examination of a number of proscopiid genera (such as *Proscopia, Apioscelis, Epigrypa, Stiphra, Astroma*) will illustrate that the caudal limbs are structurally saltatorial, being proximally expanded or inflated. In all respects, the caudal femora of the Proscopiidae are more definitely saltatorial in structure than those of the Pneumoridae which Dirsh separates in his key as having "Hind legs saltatorial."

The second error in the key concerns the presence of Brunner's organ on the hind femora. In the category of families said to possess Brunner's organ in Dirsh's key is listed the Pneumoridae. However, a survey of three of the four genera included in this family shows Brunner's organ to be absent. This was pointed out by Rehn in 1952 [4] and we have rechecked the observations he then recorded. Also included as possessing this organ is the Pyrgomorphidae (Pyrgomorphinae of most au-

[3] Entom. News, LXIII, p. 5.
[4] Entom. News, LXIII, p. 8.

thors), but Rehn in 1952 (vide supra, p. 8) and again in 1953 [5] pointed out that it may be present or absent in species of the genus *Psednura* which is a member of this assemblage.

In addition to these errors, certain omissions are evident. For example, in writing of the family Pauliniidae (Pauliniinae of most authors) Dirsh says (p. 248) that it ". . . includes only two South American genera." However, he mentions only *Paulinia* leaving us to assume that the second included genus is *Marellia*. Again, in erecting the subfamily Euryphyminae not even the number of included genera is given. Plate 46 illustrates 14 species of this subfamily belonging to as many different genera but whether or not these are all the genera included is not stated. The omission of an explanation for the abbreviate labels used in plate 1, figure 7, may cause considerable confusion. The specimen depicted in this figure is *Amblyphymus rubripes* (Euryphyminae) which is rare in collections. No explanation exists for the labels "Say" and "Sgp," but these obviously refer to the supra anal plate and subgenital plate, respectively. However, the abbreviation "Cr" used in this figure is defined in the explanation of terms (p. 226) as "crest on the dorsal surface of the spermatophore sac (occurs in *Euschmiditia* of Eumastacidae)." The structures bearing this label in the figure are the cerci, but these are of such unusual form in the species of the genus *Amblyphymus* that the erroneous label could cause confusion.

The captions of plates 51 and 61 have been reversed. Plate 51 depicts *Acrida turrita* while plate 61 illustrates *Truxalis nasutus*. References to these plates in the text are correct, however.

The geographic summaries of distribution of certain families (pp. 267, 268) are misleading and sometimes incorrect. For example, the Proscopiidae are not confined to South America (as stated), but reach Panama and Costa Rica which are definitely in Central America. The Eumastacidae do not occur over the "whole world" being absent from Europe and all but

[5] "Grasshoppers and Locusts of Australia," II, p. 21.

a limited portion of North America. Also it is misleading to give the distribution of the Xyronotidae as North America, when they occur only in Mexico, or to state that the Pneumoridae occur in "Africa" when they are restricted to south and east Africa, being absent from the major part of that continent. The same is true of the Pyrgomorphinae which are really not found over the "whole world," being absent from the West Indies and the greater part of North America.

Finally, it is obvious to us that much literature, especially of the last decade, has been overlooked by Dirsh. This is attested to by the general lack of documentation throughout the paper. It has resulted in numerous misstatements (some of which have been cited above) and may be illustrated by the following example (among the many which could be chosen). In 1906, Rehn [6] pointed out that the presence or absence of an intercalary vein, while usually a stable character, varied in the genus *Scyllina* (= *Rhammatocerus*), being present or absent in individuals of the same species. In some cases it was present on one tegmen of an individual while being absent from the other. Dirsh, however, places without qualification the genus *Scyllina* in the Truxalinae because of ". . . the absence of an intercalary vein"(p. 258).

Reviews

NOUVEL ATLAS D'ENTOMOLOGIE. HYMENOPTÈRES DE FRANCE. By L. Berland, Sous-Directeur honoraire de Laboratoire d'Entomologie, Muséum national d'Histoire naturelle. Editions N. Boubee et Cie., Paris, 1958. Vol. 1. Tenthrèdes, parasites, port-aiguillon (béthylides). Vol. 2. Port-aiguillon (fin.).

American naturalists may well envy those of France in the possession of such an admirable compendium of the native Hymenoptera. No one other than its author can speak with equal knowledge and experience on those insects; he is already the

[6] Proc. Acad. Nat. Sci. Phila., 1906, p. 41.

author of several parts of the more detailed Faune de France (1925–1947) dealing with Hymenoptera, and of La Fauna de la France, Hyménoptères, 1940.

One is immediately impressed by the wealth of illustrations, and in particular by the excellent water-colors of 366 species finely reproduced and assembled on 28 very glossy plates. These are the painstaking work of Miss Germaine Boca, artist on the staff of the Laboratory of Entomology.

Mr. Berland tells us that some 1100 genera and 11,000 species comprise the hymenopterous fauna of France, a richness due to the diverse climate and biotopes ranging from arctic-alpine to the hot, sandy terrain of the Mediterranean shores. It is obvious that 340 octavo pages cannot cover all these species —that would require an average of some thirty species to a page. The reader who must have complete treatment will find it in the more detailed volumes above referred to. The skill of the author has successfully chosen what to include. Most species figured occur over all of France. Tables are included to all families, sometimes to subfamilies, but not to genera and species, except in the case of social wasps and bees, where exceptional interest and abundance makes specific differentiations particularly desirable. The work is made readable by the inclusion of biological data, recounted in interesting style, and it is made intelligible to those little acquainted with these insects by the diverse illustrations. The taxonomy and nomenclature, being handled by an expert authority, are up to date, but in general conservative. Yet one encounters some surprises, as, for example, in the placing of the Oryssidae at the end of the Symphyta, remote from the Siricidae, from which they stem. But this is due to the difficulty of linear arrangement, for the Apocrita in turn stem from them. Raising the Pompilidae to a superfamily (done in the text but not in the scheme of classification on page 37 of volume 1) conceals their relationship with the Vespidae, but is perhaps necessary if the latter, the ants, the bethylids and the scoliids are each to be dealt with as a superfamily. It does not seem conservative, nor taxonomically sound, to split the Pompilidae into five families. I do not

understand why the name "homonotides" has been adopted for one of these when *Homotus* is cited as a synonym of *Wesmaelinius*. I also find it strange that in volume two the superfamily "vespoides" is inserted between "sphecoides" and the bees, concealing the extremely close relationship between the last two groups, but again this is *not* done in the Table of Classification on page 37 of volume 1. The last color-plate, depicting the species of bumblebees, strikes American eyes as being especially beautiful, for some of the French species bear a richness of color which our bumblebees do not attain.—J. CHESTER BRADLEY.

MANUAL OF INSECT MORPHOLOGY by E. Melville DuPorte. Pp. xi + 224, 14 illus. Reinhold Publishing Corp., New York, Chapman, Hall, Ltd., London. Price $5.00.

In this laboratory manual, a very competent insect morphologist has given teachers of entomology the benefit of his own experience of over 40 years of teaching. The careful planning and the precise and clear language throughout make it evident that this book must indeed be the result of years of use and of gradual perfecting.

There is a total of 19 chapters, in which each region or organ system is taken up in turn, and its morphology thoroughly gone into. In most chapters, to stimulate interest, there is first provided information on the origin and development of the region or system and a summary of pertinent morphological theory; after which follow careful, exact directions for practical study by means of dissections, and, for internal organs, by microscopic study of sectioned material. In each case, not one but a number of representative insects are used. Thus, in the study of the abdominal segments (taken up *before* the thorax and head), for example, seven different species are employed. Here, too, the muscles are considered, as exemplified by those of the cricket abdomen. For the thorax, only four species are studied, a stonefly, a grasshopper, a cricket, and, as an example of a specialized form, the crane-fly. Attention is given to the mor-

phological interpretation of the pleura and to the internal skeleton. There follow shorter chapters on the wings, legs, and genitalia. Finally, the first main region, the head, is taken up, and it is followed by chapters on the two chief types of mouth parts, and one on the integument. The histology and molting of the latter are studied by means of sectioned material.

The remaining one-third of the book is given to the study of the morphology and histology of the internal organ systems as seen in dissections and in histological sections. Chapter 18, for example, devotes 15 pages to the nervous system, including detailed instructions for dissection of the brain, stomodaeal system, and the incretory organs of the head, as well as for histological study.

There is no doubt that Professor DuPorte amply succeeded in his objectives which, as stated in the preface, are: to give the student a reasonably balanced foundation in the elements of insect morphology, and, to enable the student to work intelligently with a minimum of assistance from the instructor. Finally, the arrangement is such that, in actual use by students, it is an easy matter to select exercises to fit the length of the course and still provide a good cross section of the subject matter, or to reduce the requirements as to drawings in the matter of number and preciseness of detail.—R. G. SCHMIEDER.

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A TAXONOMIC STUDY OF THE NORTH AMERICAN LICININI WITH NOTES ON THE OLD WORLD SPECIES OF THE GENUS DIPLOCHEILA BRULLE (COLEOPTERA)

By George E. Ball

258 pages of text, 75 tables, 3 diagrams, 15 plates, table of contents and index

This monograph considers the geographical variation, relationships, evolution and taxonomy of the carabid tribe Licinini. A general treatment, explaining the taxonomic approach used, definition of terms, criteria for delimiting species and subspecies, etc., precedes the systematic position. The genera *Diplocheila* (subgenera *Diplocheila, Neorembus, Isorembus*), *Dicaelus* (subgenera *Paradicaelus, Dicaelus, Liodicaelus*) and *Badister* (subgenera *Badister, Trimorphus, Baudia*) are each treated in some detail. Keys to the genera and species are given throughout as well as a description (or diagnostic notes), variation, distribution and frequently locality records for each of the forms treated. The phylogeny and zoogeography of each genus are discussed in a separate section. Variation of mensurable characters is treated in the 75 tables. Fifteen plates depict structural (including genitalia) and variational features of the species discussed.

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